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LEAFLET 384

Chestnut Weevils

**how to
control
them**



CHESTNUT GROWING IN THE U. S.

Chestnut growing is expanding rapidly in the United States. The introduction of blight-resistant chestnut varieties and the development of effective methods of controlling chestnut weevils have been major factors in this expansion. Today, there are more than 250,000 chestnut growers, who are located principally in the Eastern and Coastal Plain States.

This leaflet describes chestnut weevils and recommends measures for controlling them. For information on chestnut blight and blight-resistant varieties, see Farmers' Bulletin No. 2068, "Chestnut Blight and Resistant Chestnuts."

Two kinds of weevils seriously damage chestnuts. They are known as the small chestnut weevil (*Curculio auriger*) and the large chestnut weevil (*Curculio proboscideus*). Both species are native to this country.

These pests spend many months underground, but they do not feed there. When they emerge from the ground, they fly onto chestnut trees, where they feed and lay their eggs.

They puncture holes in the burs with their curved beaks and feed on the nuts. They lay eggs deep within the nuts. The eggs hatch into larvae, or grubs, which usually devour the kernels. Chestnut weevils, left uncontrolled, can ruin an entire crop.

Development

Chestnut weevils pass through the egg, larval, pupal, and adult stages. The small weevil usually completes the cycle in 2 years; the large weevil, in 1 year.

The Small Weevil

The first of the weevils emerge from the soil in early May, fly onto chestnut trees, and begin feeding on the nuts. In about 6 weeks all the weevils are in the trees. The females lay their eggs during mid-August.

The adult is dark brown with patches of flat, yellowish hairs on its back, legs, and underparts. It is $\frac{1}{8}$ inch wide and $\frac{1}{3}$ inch long. Its beak is almost as long as its body.

Adults are aroused at the slightest disturbance. They interrupt feeding or egg laying and hide among the spines or in a crevice of a bur. Sometimes they feign death.

The female lays eight or more eggs deep within the flesh of the nut. She drills a hole in the bur with her beak, turns around, then inserts her ovipositor into the hole. Each egg is laid at the end of a separate tunnel in the nut meat. The eggs hatch into larvae in about 10 days.

The larvae are about $\frac{1}{4}$ inch long. They feed inside the nut 4 to 5 weeks, then gnaw exit holes, crawl out, and fall to the ground. They enter the soil and build earthen cells 3 to 10 inches beneath the surface.

The larvae remain underground through the winter, and transform to pupae the following fall. The adults emerge from the soil the following spring.

The Large Weevil

The weevils begin emerging from the soil in mid-August; they lay their eggs shortly thereafter. They feed on the growing burs of chestnuts and chinquapins. Occasionally they are attracted to plums, pears, and apples.

The adult resembles the small weevil—except in size. It is $\frac{1}{5}$ inch wide and $\frac{1}{2}$ inch long. Its beak is slightly longer than its body.

The female spends several hours drilling a hole in the nut before she lays an egg. She presses her beak against the bur and rocks her head and beak back and forth. Her drilling done, she withdraws her beak and inserts her ovipositor into the hole.

She usually lays 1 egg in a bur, and about 25 eggs in all. Sometimes several eggs can be found in a single bur. The eggs hatch into larvae in 6 to 10 weeks.

The larvae are about 1 inch long. They feed inside the nut 6 to 10 weeks and then, like larvae of the small weevil, they enter the soil, where they complete their development.

The larvae remain underground through the winter and spring. They transform into pupae in July. Four weeks later the pupae transform into adults.

HOW THEY COMPARE

Aspect of development	Small weevil	Large weevil
Adults begin emerging from soil...	Early May	Mid-August
Female starts laying eggs.....	Mid-August	Mid-August
Average number of eggs laid per nut.	8	1
Average number of eggs laid.....	50	25
Feeding time of larvae.....	4 to 5 weeks	6 to 10 weeks
Time spent underground.....	About 2 years	Less than 1 year
Size of the adult.....	$\frac{1}{8}$ inch wide and $\frac{1}{3}$ inch long	$\frac{1}{5}$ inch wide and $\frac{1}{2}$ inch long

Control

You can control chestnut weevils—and minimize crops losses—in the following ways:

1. *Kill the adults in the trees.* Spray the trees with DDT before the weevils lay their eggs.
2. *Kill the larvae in the soil.* Fumigate the soil around the trees.
3. *Kill the larvae in harvested nuts.* Fumigate nuts that are harvested from infested trees.



Before laying her eggs, the female weevil drills a hole in the nut with her long, sharp beak.

The eggs are laid deep within the flesh of the nut. They are translucent and vary in form and size.



Larvae enter the soil. They build earthen cells, where they later transform into pupae (right).



Adults develop in the soil. The insects emerge 1 or 2 years later and fly onto chestnut trees.

Spray the Trees

To kill adult weevils, make 3 applications of a DDT spray at weekly intervals. Apply it at the rate of 1 gallon of spray for each foot of tree height.

To prepare the spray, mix 4 pounds of a 50-percent DDT wettable powder with 100 gallons of water. For a smaller quantity, mix 3 level tablespoonfuls of powder with 1 gallon of water. If you use a powder containing a lower or higher percentage of DDT, use proportionately more or less of it.

If small weevils are present, you are likely to see them in the trees weeks before they lay their eggs. But for best results, make the first application of DDT about August 15.

Large weevils lay their eggs a few days after they fly onto the trees. To determine whether they are present, it is wise to inspect your trees regularly, especially after the first week in August. If you don't see the weevils, spread a sheet on the ground and shake a few trees with a padded pole. If weevils fall, make the first application of DDT.

If you have both species, start spraying as soon as you find large weevils. By this time, all the small weevils will be in the trees. The second and third applications should control the rest of the large weevils.

Adjust the nozzle of the applicator for a coarse or drenching spray. Cover the following areas thoroughly: The upper and lower surfaces of all leaves, the sides of the burs, the ground foliage, and the bases of the spines. The insecticide will reach

the spines if you spray from the center of the tree outward and from the outside of the tree inward.

Several years of effort may be required to control weevils in heavily infested areas. After about 3 years of spraying, however, you can get good results with fewer applications of insecticide.

Fumigate the Soil

A practicable method of controlling weevils in lightly infested areas is to kill the larvae in the soil with ethylene dibromide, a fumigant. It can be used in addition to the spraying method.

Ethylene dibromide is available from insecticide dealers in 20- to 40-percent strengths. It can be applied in small quantities with a soil injector, which resembles a huge hypodermic needle.

Before applying the fumigant, loosen the soil beneath the tree with a garden tool to a depth of 5 inches. Water the soil until it is fairly moist. Then mark off the area to be fumigated as shown in the diagram on page 6.

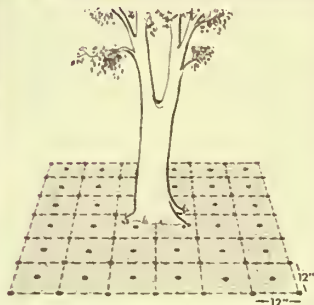
Starting at the outside of the grid, inject the fumigant 5 inches below the surface of the soil where the lines intersect. Make a second line of injections in the center of each square. Continue making injections in this manner until the entire area is covered. Each time you withdraw the injector, close up the hole by smoothing out the soil with your foot.

If the soil is hard and dry, mark off the area, as previously indicated, then drill holes 5 inches deep to

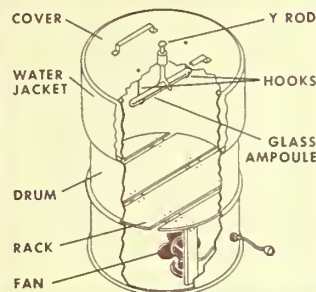
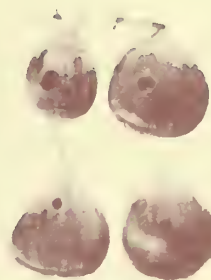


The larvae, which hatch from the eggs, are creamy white and feed inside the nut several weeks.

Larvae can be killed by applying a fumigant to the soil. See section "Fumigate the Soil," page 5.



After feeding, larvae gnaw exit holes (right), crawl out of the nut, and fall to the ground.



Cross section of a home-made water-seal fumigator. See section "Fumigate Harvested Nuts," page 6.

receive the injector's needle. Plug the holes with dry sand following each injection.

Apply 1 cc. of 40-percent ethylene dibromide, or 2 cc. of 20-percent ethylene dibromide, per injection. Decrease the amount slightly when treating light, sandy soils.

Fumigate Harvested Nuts

Nuts that are harvested from infested trees may contain larvae that can damage the nut meat and kill the plant embryos. If they are to be used for seed, they should be fumigated with methyl bromide.

Use 3 pounds of methyl bromide per 1,000 cubic feet of space. If you have a 55-gallon water-seal fumigator, the proper amount of methyl bromide to use in each treatment is 5.91 cc. Keep the nuts in the fumigator for 3 hours.

You can make a water-seal fumigator by following these directions (see diagram on p. 7):

1. Obtain a 55-gallon drum such as one used for transporting bulk shipments of oil, antifreeze, etc.
2. Remove the top of the drum by cutting around the inside of the rim with a cold chisel; hammer down all rough edges.
3. Place a collar or water jacket, made of 20-gauge galvanized iron, around the open end of the drum; crimp the bottom of collar and solder it to the drum.
4. Make a cover from the galvanized iron with a 10-inch right flange on the outer rim.
5. Drill a hole $2\frac{1}{16}$ inches in diameter through the center of the cover.

6. Rivet a pair of galvanized iron handles to the cover and solder.

7. Fasten two hooks to the inside of the cover about 4 inches from either side of the hole.

8. Fit the cover into the collar. The piece forming the rim should fit loosely around the drum inside the collar, and the ends should be brought together and fastened by loose laps. Roll and solder all seams.

9. Make a 2-inch tubulature from the galvanized iron that is flared at the top, flanged at the bottom, and has a lap joint at the side.

10. Insert the tubulature into the hole in the cover with 1 inch projecting. Solder to the cover. Fit a rubber stopper on the top of the tubulature.

11. Place an improvised rack at the bottom of the drum, and a small electric fan underneath the rack.

12. Insert the wire from the fan into a rubber stopper; fit stopper into a hole drilled into the drum wall.

13. Place a glass ampoule containing 5.91 cc. of methyl bromide on the hooks that are attached to the inside of the cover.

14. Fit an 18-inch Y-shaped rod through the tubulature; lean the forked end against the ampoule.

To operate the fumigator, pour water into the collar until it is about three-quarters full. Pack chestnuts in bags and place them on the rack at the bottom of the drum. Place the cover on the collar. Thrust the Y-shaped rod downward, and break the ampoule. Start the fan.

Remove the cover at the end of 3 hours. Keep the fan going for $\frac{1}{2}$ hour before removing the nuts.

Filbertworms

Chestnuts are often attacked by filbertworms, which may be mistaken for the larvae of chestnut weevils.

Filbertworms can cause considerable damage if left uncontrolled. You can easily determine which insect is present by closely examining damaged chestnuts. Filbertworms feed between the bur and chestnut shell before entering the nut. While feeding, they produce a gummy substance that causes the bur to adhere to the nut. Bur and nut fall to the ground together.

The larvae of chestnut weevils do not feed or tunnel between the bur and the nut.

You can control filbertworms by applying a lead arsenate or DDT dust or spray to infested trees.

Use a 40-percent lead arsenate or 10-percent DDT dust, which is available ready for use from insecticide dealers. Or use a spray prepared as follows: Mix 3 pounds of lead arsenate or 2 pounds of a 50-percent DDT wettable powder with 100 gallons of water.

In Oregon, growers control filbertworms with two applications of insecticide. They make the first application soon after the eggs hatch, which is about the middle of July, and the second 3 weeks later.

Chestnut Mites

The year after you spray trees with DDT watch for chestnut mites on the leaves. DDT kills many of the parasites and predators that normally hold these mites in check. Left uncontrolled, chestnut mites will brown or scorch the leaves, causing severe injury to the trees.

To control the mites, mix 2 pounds of a 15-percent Aramite wettable powder or a 25-percent malathion wettable powder with 100 gallons of water and spray it on the trees. One application usually is enough.

If you are also spraying for weevils, you can add Aramite or malathion to the DDT spray when making the first application.

PRECAUTIONS

DDT and malathion are hazardous if used carelessly. Avoid unnecessary exposure while handling and applying. Clean and wash all equipment. Wash hands and clothing thoroughly.

Ethylene dibromide is combustible; keep it away from open fires. It is toxic to people and animals but not dangerous when properly handled. See label on container regarding precautions.

Empty soil injectors after use, and clean them immediately with kerosene.

Methyl bromide is injurious to animals. Use it carefully.



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